

## CHINA'S SPACE CAPABILITIES AND THEIR REGIONAL SECURITY IMPLICATIONS

BY

MR. WEN-CHI HUANG  
International Fellow from Taiwan

### DISTRIBUTION STATEMENT A:

Approved for Public Release.  
Distribution is Unlimited.

**Only a work of the United States Government is not subject to copyright. The author is not an employee of the United States Government. Consequently, this document may be protected by copyright.**

USAWC CLASS OF 2011

This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.



U.S. Army War College, Carlisle Barracks, PA 17013-5050

The U.S. Army War College is accredited by the Commission on Higher Education of the Middle State Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. <b>PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.</b>					
1. REPORT DATE (DD-MM-YYYY) 18-03-2011		2. REPORT TYPE Strategy Research Project		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE  China's Space Capabilities and Their Regional Security Implications				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)  Mr. Wen-Chi Huang				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Dr. David Lai Strategic Studies Institute				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES) U.S. Army War College 122 Forbes Avenue Carlisle, PA 17013				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT Distribution A: Unlimited					
13. SUPPLEMENTARY NOTES Only a work of the United States Government is not subject to copyright. The author is not an employee of the United States Government. Consequently, this document may be protected by copyright.					
14. ABSTRACT China's space programs have made large strides in the last decade. China has become the third country capable of launching manned space craft after the successful return of the <i>Shenzhou-VI</i> spacecraft. Besides this sensational achievement, China managed to establish a comprehensive satellite network for both military and civilian applications. Its satellite jamming and anti-satellite tests in 2002 and 2007 drew international attention. This dramatic development has significant political, economic, military and psychological implications to Asia regional security, and the world eventually. China's successful space program has greatly enhanced its national pride and confidence. China's advances forced the international community, especially the Western countries, to re-evaluate China's technological development and capability. China's space programs also help China to develop a large pool of technological and scientific talents. More importantly, it puts China on a solid leadership status in East and Southeast Asian regions. The improved space capability is no doubt a force multiplier to its military modernization. Therefore, it will help China to exert its influence and challenge the U.S. leadership and security interest in the region.					
15. SUBJECT TERMS <i>Shenzhou-VI, satellite network, regional security, space weapons</i>					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT  UNLIMITED	18. NUMBER OF PAGES  38	19a. NAME OF RESPONSIBLE PERSON
a. REPORT UNCLASSIFIED	b. ABSTRACT UNCLASSIFIED	c. THIS PAGE UNCLASSIFIED			19b. TELEPHONE NUMBER (include area code)



USAWC STRATEGY RESEARCH PROJECT

**CHINA'S SPACE CAPABILITIES AND THEIR REGIONAL SECURITY  
IMPLICATIONS**

by

Mr. Wen-Chi Huang  
International Fellow from Taiwan

Dr. David Lai  
Project Adviser

**Only a work of the United States Government is not subject to copyright. The author is not an employee of the United States Government. Consequently, this document may be protected by copyright.**

This SRP is submitted in partial fulfillment of the requirements of the Master of Strategic Studies Degree. The U.S. Army War College is accredited by the Commission on Higher Education of the Middle States Association of Colleges and Schools, 3624 Market Street, Philadelphia, PA 19104, (215) 662-5606. The Commission on Higher Education is an institutional accrediting agency recognized by the U.S. Secretary of Education and the Council for Higher Education Accreditation.

The views expressed in this student academic research paper are those of the author and do not reflect the official policy or position of the Department of the Army, Department of Defense, or the U.S. Government.

U.S. Army War College  
CARLISLE BARRACKS, PENNSYLVANIA 17013



## ABSTRACT

AUTHOR: Mr. Wen-Chi Huang

TITLE: China's Space Capabilities and Their Regional Security Implications

FORMAT: Strategy Research Project

DATE: 18 March 2011      WORD COUNT: 7,735      PAGES: 38

KEY TERMS: *Shenzhou-VI*, satellite network, regional security, space weapons

CLASSIFICATION: Unclassified

China's space programs have made large strides in the last decade. China has become the third country capable of launching manned space craft after the successful return of the *Shenzhou-VI* spacecraft. Besides this sensational achievement, China managed to establish a comprehensive satellite network for both military and civilian applications. Its satellite jamming and anti-satellite tests in 2002 and 2007 drew international attention. This dramatic development has significant political, economic, military and psychological implications to Asia regional security, and the world eventually. China's successful space program has greatly enhanced its national pride and confidence. China's advances forced the international community, especially the Western countries, to re-evaluate China's technological development and capability. China's space programs also help China to develop a large pool of technological and scientific talents. More importantly, it puts China on a solid leadership status in East and Southeast Asian regions. The improved space capability is no doubt a force multiplier to its military modernization. Therefore, it will help China to exert its influence and challenge the U.S. leadership and security interest in the region.





## CHINA'S SPACE CAPABILITIES AND THEIR REGIONAL SECURITY IMPLICATIONS

China's space ambition began as early as 1958 after the Soviet Union successfully launched the *Sputnik I* satellite.<sup>1</sup> However, its first satellite was not launched until April 1970, with barely any meaningful function. During that period, with the determination to catch up with Western powers and an expanding pool of rocket and space scientists, China did gradually build up its capability, knowledge, technology and organizations to develop ballistic missiles and space rockets.<sup>2</sup> Therefore, by the 1980s, China was capable of launching satellites and engaging a variety of space tests. It even went further to join the international commercial satellite market and launched more than 30 satellites for European and Asian countries.<sup>3</sup> Since the mid-1990s, rapid economic growth along with easier access to former Soviet space technologies has helped its space programs to reach a new level.

Today, besides realizing its dream to send Taikonauts<sup>4</sup> to the orbit, China has begun to organize a robust satellite network with 22 different types of satellites by providing comprehensive intelligence, surveillance, reconnaissance, communication, remote sensing, meteorological monitoring, global positioning and target acquisition capabilities.<sup>5</sup> It is expected that China's space capability development will greatly improve its comprehensive national power. More importantly, this capability may eventually have the potential to change international and regional security landscape.<sup>6</sup>

This research drew a variety of sources from China's space program white papers and analyses done by American, European, Indian, Chinese and Taiwanese regional security experts to explore potential security and strategic implications of rapid Chinese space capability development. For practical purposes, the research will study

Chinese space policy, doctrine and initiatives and its past history and current progresses to look into their political, economic, military and psychological impacts to the regional countries and global community. In doing so, the study hopes to provide constructive recommendations for strategic decision-makers to consider when they approach China's rising space capability.

From a political standpoint, the successes in the manned space program and other space capabilities have no doubt significantly boosted China's national confidence and self-esteem. After possessing more and more critical technologies, China will be less susceptible to sensitive technology export controls imposed by the U.S. and other Western powers. More importantly, with increased space capability and sophistication, China is better positioned as an active player in space and the strategic arms control arena. In the future, the exclusive strategic arms talks between the U.S. and Russia must include China to make sure of its cooperation. Overall, China will be more influential in the global political and strategic arena. With that in mind, the international community is increasingly concerned of China's ambition and intention in space development. For example, its satellite jamming and anti-satellite missile tests in 2002 and 2007 triggered an outcry from the U.S. and other major European and Asian powers about China's intention toward the space arms race.<sup>7</sup> Furthermore, China's notorious record as one of the world's leading weapon proliferators made the U.S. congress and other international non-proliferation organizations extremely cautious about its export of dual-purpose space technology to Iran and other countries.<sup>8</sup>

Economically, China's expanding space capability has not much impact to its overall gross domestic product (GDP). However, the space programs, especially

manned space flight programs, will help China develop a large number of young engineers and scientists and accelerate its technological spinoffs and innovations.<sup>9</sup> This will greatly improve China's competitiveness in future high-tech industries. China's international cooperation programs, particularly those with Brazil and European countries, provide it renewed opportunities to absorb new technologies, and greatly enhance China's geographical and geological information system and its ability to formulate a better designed territorial management plan to more effectively use its agricultural, forestry, mineral resources and deal with natural disasters such as long drought in Northern and Southwestern China. More importantly, its new generation oceanographic and meteorological remote sensing satellites will greatly help its ability to understand long term climate pattern changes in its surrounding sea areas and develop better weather forecasting system to prepare possible natural disasters and early disaster management plans.

Militarily, this comprehensive space program will be a critical force multiplier and key component to its military modernization. With a robust intelligence, surveillance and reconnaissance (ISR), electric warfare (EW), communication and global positioning satellite network, the People's Liberation Army (PLA) will be better equipped to enhance its strategic early warning, joint command and control, long-range precision targeting, expeditionary operation support and long range strike capabilities.<sup>10</sup> In particular, China's future aircraft carrier battle groups, blue water fleets and strategic air force will benefit greatly with this newly established satellite network. In fact, they will not be fully operational in modern naval terms without robust satellite and space asset network support. In the future, with a robust space capability, the PLA will be more capable of

executing anti-access and area denial operations ( for example, providing early warning, target acquisition and terminal guidance for its DF-21D anti-ship ballistic missiles and other long range cruise missiles) and rapid responses to most contingencies in its surrounding regions. Further, its anti-satellite capability, as yet unable to reduce U.S. space capability, will still help it to temporarily deny certain American space assets, delay U.S. and international intervention and give China necessary time to neutralize its targets, especially in the event of conflict in the Taiwan Strait.<sup>11</sup>

In the psychological and information perspectives, the successes in manned space flight programs and improved satellite capabilities would deliver a very powerful strategic communication message to both the Chinese population and global audiences. They justified the causes of Chinese leadership, by providing more innovations, economic spinoffs and higher national prestige, to engage in such an expensive endeavor and further its ruling legitimacy by firming the loyalty contract between the Chinese Communist Party and its governed population.<sup>12</sup> For other global audiences, these achievements manifested Chinese technological advances and reaffirmed its great power status as the third country capable of pushing manned space programs. Especially for countries having cooperative relations with China, such as Shanghai Cooperation Organization (SCO)<sup>13</sup> members, China's technological progress can help consolidate its leadership status. Even on more practical terms, improved Chinese communication and relay satellites will help to build a more effective mobile communication, digital radio and broadcasting network to serve as platform of strategic communication efforts. During peacetime and wartime, this capability will be very

important to counter enemy information, EW and other communication efforts to maintain information control over its target audiences.<sup>14</sup>

Chinese rapid development of space capability certainly will impact the U.S. strategic and security interests in the Asia Pacific region, though not its global interest in the near future. Therefore, the research will further explore several specific issues to clearly understand China's space dominance in the region, including better PLA joint operation and anti-access/area denial capabilities pose what kind of threats to U.S. military in the region; the threat of future PLA long-range strike capability to the regional countries; the impact of a new blue water PLA navy to the strategic landscape of Asia Pacific region; the expeditionary capability and its impact to PLA operational doctrine and national security policy; and the prospect for a benign future cooperation between the U.S. and China, especially peaceful development and exploration of space commons.

#### China's Space Policy, Doctrine and Programs

In its space white paper, China highlights its aims as: "to explore outer space, and enhance understanding of the Earth and the cosmos; to utilize outer space for peaceful purposes, promote human civilization and social progress, and benefit the whole of mankind; to meet the demands of economic construction, scientific and technological development, national security and social progress; and to raise the scientific quality of Chinese people, protect China's national interests and rights, and build up the comprehensive national strength."<sup>15</sup> China clearly illustrates that Chinese space programs are designed to enhance its comprehensive national power, secure national interests and improve scientific and technological innovations. Overall, China

does not have a formal space policy and doctrine except its space white paper, which depicts its overall space objectives, plans and programs. This also shows the transitional and experimental characteristics of China's space enterprise since its large space reorganization in the 1980s. Nonetheless, clues are still accessible on doctrinal thinking and program development by looking at China's space plans and its efforts in space affairs.

As highlighted in its space white paper, China is pursuing a peaceful development and exploration of outer space. It is one of the major proponents to outer space demilitarization. During the United Nations Conference on Disarmament in 2002, China and Russia jointly proposed to ban all forms of weapons in outer space, including anti-satellite weapons, which did not receive any positive response from the U.S.<sup>16</sup> Officially, China seems to support peaceful development and utilization of outer space. Nonetheless, it obviously still engages in a variety of space weapon programs. The most notable cases are its laser jamming efforts aimed at U.S. satellites flying over China in 2002 and anti-satellite (ASAT) missile testing in 2007.<sup>17</sup> This apparent policy inconsistency confused many international security experts. Most of them believed that this is due to its perception over inevitability of space militarization and U.S. space dominance.<sup>18</sup> But for China's most immediate concern, space weapons could serve as "trump card" or "assassin mace" weapons in certain situations, especially in a possible U.S. intervention in Taiwan Strait crisis scenario.<sup>19</sup>

In its 2004 and 2006 Space White Papers, China highlighted its dedication to a self-sufficient space capability and boasts that most of its satellite and unmanned and manned space flight programs are indigenously developed by Chinese scientists and

engineers.<sup>20</sup> However, its space development history proved otherwise. China not only drew numerous technologies, including the *Shenzhou* spacecraft, from Russia, but also bought or stole them from the U.S. and other countries.<sup>21</sup> For accessing necessary technologies and experiences, China places great importance in its space cooperation programs with Russia, the European Union, Brazil and other regional countries. China also wants to leverage its space capability to expand its influence over other countries, especially those non-Western countries. Thus, China and seven other countries formed the Asia-Pacific Space Cooperation Organization (APSCO) to promote a multi-lateral cooperation platform.<sup>22</sup> All this shows that, beside indigenous development programs, China is eager to explore new technological sources and expand its space influence in order to build its future space capabilities.

Currently, China has had robust and comprehensive space programs, including space research, development and production; extensive ground operations and a telemetry, tracking and control (TT&C) network; space launch vehicles including recent development of mobile launch vehicles; a variety of satellites systems; and manned space programs.<sup>23</sup> In spite of export controls by the U.S., China still managed to produce a variety of satellites and gradually improved its sophistication and quality. Currently, China's military still controls and operates these programs.<sup>24</sup> Therefore, the PLA has significant influence over satellite and other space technology development. China has had a very ambitious plan to develop its manned space flight programs and satellite network. So far, its space flight programs outpace satellite programs. Many experts believed that Chinese leadership wants to garner domestic support, build national prestige, stimulate technological innovation and improve its international stance

with this highly publicized undertaking.<sup>25</sup> This imbalanced development probably manifests its cautious approach to space programs. The export limitation by the U.S. and other Western powers does constrain China to make a breakthrough in certain critical technologies. Before controlling those key technologies, China is still willing to approach its satellite programs in a “touching the stone while crossing river”<sup>26</sup> manner. Moreover, China has good reasons to be patient. Its strong economy and huge market offer attractive opportunities for foreign investors and high probability for buying advanced space technologies. Many international businesses are highly interested in China’s vast satellite communication and broadcasting market. Their entrance into China’s market is expected to bring some necessary technologies to help China accelerate its satellite development.

From extensive study of the first Gulf War in 1991 and recent U.S. military operations, the Chinese military clearly understands that its military modernization will not be complete without a strong military space capability.<sup>27</sup> Even without expeditionary plans in mind, a space-enabled command, control, communication, computer, intelligence, surveillance and reconnaissance (C4ISR) system is a critical component for successful homeland defense and area-denial operations. For that reason, it has allegedly developed several satellite programs to support military modernization goals.<sup>28</sup> Among them, military communication, multi-spectral imagery (visible, infrared/electric-optic and synthetic aperture radar), global positioning and timing, oceanographic satellites, electronic intelligence, space jamming and anti-satellite weapons are prioritized development programs.<sup>29</sup> With the U.S. and other major Western countries restricting their technology transfer to China, these programs show limited progress.



Especially in the satellite imagery and remote sensing, its satellites are still far from accurate under Western commercial terms. However, China will catch up with other countries. Some obvious breakthroughs, such as anti-satellite missile test and mobile rocket-launched satellites, have demonstrated a sharper learning curve. Its development potential simply can not be ignored.

In terms of space support programs, China currently has three major launch centers, Taiyuan, Jiuquan and Xichang (a fourth one in Hainan Island is under construction), and numerous ground stations to form a space operation network. Since 2002, China has maintained a steady progress in its space operation tempo and infrastructure building. Its launching control and the quality of space research programs are greatly improved. In particular, China is capable of supporting its military exercises and overseas fleets with mainland-wide communication and global maritime communication satellites.<sup>30</sup> These all show that it has gradually built up a powerful space support capability.<sup>31</sup> Over time, even with continuous U.S. technology transfer restrictions and export control measures, China is still expected to accumulate enough experiences and know-how to accelerate its space programs and improve its overall satellite quality. In the following content, the study will explore the political, economic, military and psychological/information implications of China's space programs.

#### Political and Economic Implications

Chinese leaders regard current space capability development, especially the manned space flight program, as important as the development of nuclear weapons in the 1950s.<sup>32</sup> When it sent the first Taikonaut into space in 2003, China has become the third country capable of effective manned space flight, after Russia and the U.S.

Chinese leadership regarded it as an achievement to restore China's long lost historical prestige.<sup>33</sup> According to its 2006 space white paper, China intends to send a manned spacecraft to the Moon by 2030, and in the distant future, to land Chinese Taikonaut on Mars. From Chinese leadership statements and its ambitious space flight plans, this is obviously a strong political consideration. China's successful space flight program has had very significant positive influence on the Chinese people. But it is even more significant in promoting the legitimacy of Chinese Communist Party's rule of China. Besides improving national confidence and garnering political support, China's space development also encourages many young and talented students to join this enterprise, especially the basic sciences related to space development. The expected rich supply of space-related engineers and scientists will help China to build a foundation for its future innovation and competitiveness in the long run. In turn, this momentum will boost its future economic development and improve the averaged living standard of the common population, which is the most important pillar of communist rule. Therefore, China's space program serves as a very important launch pad for its further technological development and support for Communist Party rule.

Obviously, with its stronger space capability and accumulated successes, China will gradually gain more bargaining power and a higher regional and international stance over space affairs. In the future, important issues like strategic arms and space weapon limitation negotiations will no longer be dominated by the U.S. and Russia. The international community has to take China into account. Moreover, China has been aggressively promoting space cooperation with other regional countries and important Western players. For example, China's proactive attitude toward organizing the Asia-

Pacific Space Cooperation Organization clearly shows its intention in building its international political capital. Therefore, in addition to its economic magnetic effect, space power will have the potential to become another geopolitical leverage.

For the time being, Chinese commercial satellite sales and launching services are not as competitive as their American and European counterparts in terms of technological advances and quality. However, China itself is a huge positioning/navigation, telecommunication and satellite broadcasting market. The domestic demands can provide very strong support for its satellite development and help China to draw Western commercial satellite technologies with certain incentives. Moreover, with most developing countries unable to buy expensive Western satellites, reasonable functioning Chinese satellites with packaged services are attractive choice.<sup>34</sup> Most importantly, China is willing to sell satellites to those countries restricted by the U.S. and European Union, such as Venezuela. Therefore, it can find a potential economic niche in this mid to low end satellite market. To a large extent, satellite sales can support its space industry and serve as a diplomatic tool to shore up China's relationship with those countries. Therefore, China will be likely to continue this business quest.

This aggressive market seeking approach will obviously lead to a concern about technological proliferation. As is commonly known, most space technologies are dual-purpose and subjected to export controls in many countries, especially the U.S. and European countries. For criminal and terrorist organizations and some "outlawed" regimes, encrypted satellite communication and other space technologies can help them engage in many secret activities and avoid the detection from the international

law-enforcement community. Other technologies like navigation/positioning, electronic intelligence and space imagery can help improve accuracy and guidance of ballistic missiles. If China sells these technologies to countries like North Korea and Iran, it runs the risk of helping those nations to greatly improve their otherwise inaccurate medium and long range ballistic missiles. From China's long term close cooperation relationship with North Korea and Iran and based on its least satisfactory record in export control, this is a very possible scenario.<sup>35</sup> Thus, when China explores its space market access, the international community has to monitor the uses and end users of those systems.

### Military Implications

Space capability development is a key component in China's military modernization efforts.<sup>36</sup> In particular, if China wanted to realize its aspiration of "winning local wars under high-tech information conditions," even only operating within and near China's territory, it has to build a supportive military space support infrastructure. With most of its air, naval and ground forces still heavily dependent on traditional communication means, maneuvering its million-strong force over China's huge land mass poses a serious challenge, especially under modern high-tempo military operations.<sup>37</sup> Based on operational experiences in the last three decades, including the 1980 Israeli-Syria War, 1990-1991 First Gulf War, and 2003 Iraqi War, attackers would utilize every possible jamming measure during the preliminary stage to make sure targets are "blind" and "deaf."<sup>38</sup> This will make traditional command, control, communication, computer, intelligence, surveillance and reconnaissance (C4ISR) measures more susceptible to electronic jamming. Moreover, a large amount of

battlefield management and intelligence data cannot be transmitted with line-of-sight communication.<sup>39</sup> Thus, broadband communication satellites played an important role to military success, which is still a weakness of the PLA. More importantly, all possible PLA military operations in the Western Pacific region impact on U.S. security interests. Among its most serious concerns, the Taiwan Strait military crisis is very likely to involve U.S. intervention. Its area-denial and anti-access efforts would be futile without effective strategic warning, precision targeting and integrated C4ISR systems to monitor movements of U.S. forces and deploy its military counter-intervention assets. Based on the operational lessons learned from Operation Desert Shield/Storm in 1991 and Operation Iraqi Freedom in 2003, the U.S. military effectively used space capabilities to support its war efforts in almost every aspect.<sup>40</sup> Its lightening maneuver pace and responsiveness made its conventional enemies vulnerable to U.S. attacks. China understands what it will face if the U.S. involves in a Taiwan Strait crisis. Therefore, China has focused most of its satellite programs in these critical areas, including integrated command and control, remote sensing, global positioning/timing, electronic intelligence, multi-spectral satellite imagery, digitized satellite communication and countermeasures. All serve to improve its integrated military capabilities and reduce its vulnerability from other countries, especially the U.S.<sup>41</sup>

In recent years, many experts are concerned with China's aircraft carrier program and its intention, especially its impact to regional security. They claim that this capability will greatly improve China's expeditionary and force projection reach.<sup>42</sup> At the same time, Chinese leadership has declared that China will further its maritime security and vested interest with a modern Chinese naval fleet. This shows a renewed Chinese

ambition at sea. Since 2001, China has greatly extended its overseas naval activities, including global-wide port calls and combined naval exercises with several countries.<sup>43</sup> It even sent some of its newest naval vessel to enforce counter-piracy operations in the Arabian Sea.<sup>44</sup> All this demonstrates its intention to build a more expeditionary naval force. Once its aircraft carrier battle groups are operational, China will have a much stronger long-range strike capability.

However, an aircraft carrier battle group is not merely a combination of various naval vessels. It is a system of systems requiring sophisticated C4ISR system, over horizontal detection, real-time precision targeting, three-dimensional force protection, and long range strike capabilities.<sup>45</sup> In high seas far from China's coast, a modern aircraft carrier cannot count on traditional means to maintain these functions. Digitized wide-band satellite data link is a basic requirement for an aircraft carrier operating in the modern naval battlefield. Moreover, aircraft carrier battle groups need accurate imagery satellites to support long-range early warning and targeting. Without these resources, it will be difficult to gain clear situational awareness, if not be totally blind and deaf. Therefore, China's new expeditionary naval fleets will not likely be able to operate effectively without sophisticated satellite support.

China is pursuing an information-age modern military force, which again needs significant space support. During the 2001 Operation Enduring Freedom and 2003 Operation Iraqi Freedom, the U.S. military forces demonstrated an unprecedented capability of sensor and shooter fusion.<sup>46</sup> The shock and awe effect was not merely from massive fire power. It came from, to a large extent, real-time intelligence, surveillance and reconnaissance (ISR) input and simultaneous datalink feeds between

ground operator and air assets. Large amounts of information transferred through military communication satellites made a common operating picture and situational awareness possible, and then a perfect sensor-to-shooter killing cycle. If China wants to build a modern force close to such terms, it has to greatly improve its communication, ISR, and global positioning/timing satellites.

In 2006, the DoD annual report to the Congress pointed out that China is developing anti-aircraft carrier ballistic missiles and other anti-access and area-denial weapons.<sup>47</sup> This is a direct challenge to the U.S. naval fleet in the Pacific. Chinese planners came up with the idea to use *Dongfong* (DF) 21 medium range ballistic missiles equipped with sophisticated seekers against U.S. aircraft carriers.<sup>48</sup> Again, these programs are not possible without very accurate satellite ISR and targeting systems, which China still has much to do to reach its expected level. Naval vessels at sea are moving targets and difficult to hit.<sup>49</sup> It is especially difficult, if not impossible, to hit a U.S. aircraft carrier equipped with multiple countermeasures. So far, China's ISR satellites seem to lack such capability to closely monitor movements of a U.S. carrier battle group.<sup>50</sup> Thus, to improve its anti-access weapons, China definitely will continue to invest large resources in the area.

Chinese military thinking emphasizes, "Winning rapidly in distant battlefield and decisively in the initial campaign."<sup>51</sup> This approach will be definitely important in the Taiwan Strait conflict, where China has to rapidly neutralize Taiwan's resistance to prevent any timely international intervention. Thus, in last two decades, China has aggressively developed its air force, naval aviation forces and the Second Artillery Corps. It has more than 1,500 short to medium range ballistic missile, increasing

numbers of cruise missiles, sub-launched ballistic missiles, hundreds of fourth generation fighters (including Su-27s, Su-30s, J-10s) and new naval combatants and submarines (such as *Kilo*-class, *Yuan*-class, *Shang*-class, and *Song*-class submarines, *Sovremenny*-class, *Luyang-I/II* and other new generation destroyers and frigates, among many others). Nonetheless, these new air and naval platforms will be less effective without a satellite-enabled C4ISR network. Especially when it has to engage distant and dispersed enemy forces far away from its border, such as a border conflict with Japan or India, China would have a difficult time exerting its strategic strike capability under its current less-synchronized land and air based C3 systems. Therefore, it will continue to work on improving its capabilities in this field. In the last two decades, from China's proactive efforts to acquire A-50 AWACS aircraft, participate in EU's *Galileo* project, develop *Beidou* positioning/timing satellite, land/maritime communication satellite, cooperate with Brazil to develop earth survey/observation satellite, and build a comprehensive ground support space infrastructure, all proved that improving its air/space capability to support its strategic strike force is as major objective in its military modernization plan.<sup>52</sup>

### Psychological and Information Implications

China's aggressive efforts and great successes in manned space programs have sent a powerful message to its regional and global audiences.<sup>53</sup> China is now a great power of the world. It should have its entitled rights in space and other important arenas. The continuous improvements in manned and unmanned space technologies and sophistication also showed that China is gradually away from its past technological backwardness. It will someday be a member of technologically advanced countries like



the U.S., Japan, and Western European countries. Most importantly, China has recovered its long lost national prestige. Certainly, this also made many people predict that China will be the next global challenger to U.S. dominance.

In practical terms, China's space progresses, especially its communication and broadcasting satellites, have significantly improved its information operations capabilities. Currently, its mobile communication and broadcasting coverage has extended to almost every corner of China and even to its surrounding countries. The Chinese government can now use various means to promote and instill its ideas to both the Chinese population and neighboring people. From experiences of *Voice of America* and Western sponsored broadcasting programs, these satellite-based TV programs will have a cascading effect in regional population in a long run. Moreover, in major natural or man-made disaster events, as proved in Sichuan earthquake, the satellite communication systems can help government to calm the inflicted population and coordinate disaster relief efforts so as to accelerate disaster relief efforts.

However, for China's neighbors, the U.S. and Western world, the most important concern is China's real intention and plan in space development. China's inconsistency between its stated policy and behavior, secrecy, and less-than-cooperative attitude in space programs, all have obvious negative psychological effects to other countries. In particular, its 2007 anti-satellite missile test led to serious concerns and suspicions from the U.S. and many regional players. This is definitely not a positive development for China.<sup>54</sup> From Chinese public sources, it is obvious that many Chinese political and military leaders believe in the inevitability of space militarization, particularly U.S. deployment of space weapons.<sup>55</sup> This serious misunderstanding of U.S. space policy

leads to a mentality that probably will jeopardize future possible space cooperation between China and other major space players.

### Issues in questions

The impact of Chinese space developments on the regional security landscape and U.S. national security interest will gradually emerge. China's space programs are still far from helping it to improve its comprehensive national power and international political bargains. Nonetheless, its great successes in manned space programs did help its national prestige and image as a technologically advanced country in the Asian-Pacific region.<sup>56</sup> Whether its space programs will help its international political influence, to a large extent, still depends on other programs besides manned space programs. If China could make obvious breakthroughs in its military satellite programs, its overall operational capabilities will improve greatly. In turn, its leverage over border disputes and regional security issues, such as South and East China Sea maritime security, will become much stronger. However, no matter how aggressive China pushes in its space programs, it is nearly impossible to challenge U.S. space dominance in the foreseeable future.<sup>57</sup> What the U.S. government has to pay attention to is China's quick development of a large pool of basic and space related scientific talents, who will be able to accelerate China's innovative and technological capability. Compared with the retiring and aging space scientist group in the U.S., China's space scientists and engineers are on average only 40 years old. Its universities and graduate schools produce 12 times more technology and science-majored students than the U.S.<sup>58</sup> Its current slow progress in certain fields, to a large extent, is due to the talent disruption in the Culture Revolution in the 1960s to 1970s when numerous scientists and engineers

were thrown into labor camps. Thanks to its economic boom and space success, China is making up this huge generation gap. The massive new generation of scientists and engineers will make significant contribution to China's technological innovation, economic development and military modernization in the future. Thus, their impact on regional security and U.S. regional interest will gradually become obvious.

China's space program will pose significant challenges to international community in terms of weapons proliferation and space arms race. China's military still has a significant control over space programs. Due to its testing of an anti-satellite missile, satellite jamming systems and other space weapons, many Western and U.S. security experts are extremely suspicious of China's intention in space weapon development.<sup>59</sup> However, from its stated policy and low-key manner in those weapons, along with its space technological level being far behind U.S. and Western powers, it is unlikely that China will engage in a space arms race with the U.S. It is more likely that China will develop those weapons as part of its anti-access and area-denial strategy—to delay U.S. forces rushing to a Taiwan Strait military crisis. Actually, its focus on economic development will exclude the possibility to engage in an outright space race with the U.S. and jeopardize its continuous introduction of new Western technologies.<sup>60</sup>

However, China's space industry is eager to find new business market and make up its limited official budget. Its aggressive pursuit of business opportunities could make China a space technology proliferator. China has already had a notorious record in the past by selling nuclear and ballistic technologies to several dictator regimes.<sup>61</sup> With its success in selling communication satellites to Nigeria and Venezuela, China is likely to continue this business and may sell those facilities to other "less legal-bidding

countries.” In turn, those technologies are likely to help countries like North Korea or Iran to improve their ballistic missiles and other military systems or end up in criminal or terrorist hands. Because the U.S. has imposed satellite export limitation on China, it is less likely that China will cooperate with the U.S. by limiting its satellite sales and endanger its space industry. Therefore, international community has to develop other measures to ensure China will not continue this business-seeking approach, for example, providing satellite launch cooperation opportunities in exchange of limiting satellite sales to certain undesired countries.

The space program will give China a powerful leverage to regional security issues, especially its traditional territorial disputes and Taiwan issue. Currently, the Asia-Pacific regional countries are cautious about China’s space capability developments.<sup>62</sup> Unlike the low possibility for China to challenge U.S. space dominance, it is very likely that the continuous progress in China’s space capability will change the security landscape in the region. Proven by its current success in Arabian Sea counter-piracy efforts, new space capability will extend its power projection reach. Judging China’s satellite and other space asset development, it is evident that China is developing an anti-access and area-denial capability. Once it becomes fully operational, China will be able to exclude U.S. intervention for a certain period of time.<sup>63</sup> Indeed, with a few targeted attacks against key U.S. space assets, China can delay U.S. military intervention by several days or longer—which is enough for China to launch military actions against Taiwan. This is an especially serious concern for Taiwan’s defense planners. For Taiwan to face an all-out Chinese invasion, it must count on the U.S. aircraft carrier battle groups for its salvation—but salvation time is limited, probably by

weeks only, if not by days. It appears that Taiwan has two options: either to build up a very strong military force as deterrent or to bog down on China's reunification demand. Both will impact the overall security landscape in the region and compromise U.S. regional interests.

Furthermore, in some disputed areas in the East and South China Seas and the Sino-Indian border, with its improved C3 and ISR satellite capability, and newly developed airborne warning and air control systems (AWACS) and unmanned aerial vehicles (UAV), China can effectively monitor adversaries' military movement and outmaneuver them at sea and on land. This is already obvious in the South China Sea. Chinese naval capability has outnumbered and outgunned over all regional claimants in this area.<sup>64</sup> Once combined with integrated space support, these countries' naval fleets will be simply sitting ducks at best. This is a serious threat even to India. China has procured new generation anti-ballistic missiles such as S-300s and S-400 air defense missiles, which are capable of shooting down less sophisticated Indian ballistic missiles, thus reducing their deterrent value. Therefore, China does not need to develop a space capability as powerful as that of the U.S. and is still able to change the regional security landscape. So far, this is the most likely security goal that China wishes to achieve.<sup>65</sup>

The intention, scale, prospects, and constraints of China's space program will dictate international responses. China's space development, in terms of technologies, human capital and investments, will be limited in scope. Even its manned space program, with only 2 billion *yuan* (about \$300 million) annual budget, is less likely to reach former Soviet scale, let alone compete with the U.S.<sup>66</sup> China is likely to continue its focused programs in communication, remote sensing, global positioning/timing, ISR,

space imagery, electronic intelligence and meteorological satellites, along with manned/unmanned space flight programs and certain secret counter space weapons. These systems will better serve China's near to medium term requirements.<sup>67</sup>

Although having a series of manned/unmanned space flight successes in the last decade, China's plan to build space station and send a remote controlled robots to the Moon has not realized as scheduled.<sup>68</sup> It seems that China has a difficult time under current budgetary constraints and Western (especially the U.S.) imposed technology transfer controls. Even though China has worked extensively with Russia in space development since 1995, it has not been able to get more advanced space technologies from Russia. Thus, China has to develop its own capability indigenously and access other sources to provide necessary technologies. With most Western powers still suspicious of its professed peaceful rising, the U.S., Russia and other European developed countries are unlikely to lift their export restrictions soon.

Nonetheless, this is not necessarily a disadvantage for China. As we have witnessed in its economic, scientific, technological and military developments, China has been in a very sharp learning curve since the 1980s. Its massive cohort of young and enthusiastic research and development force is pushing its technological innovation and building a robust scientific foundation. Once fully mature, China will have total control over new technologies and establish a self-sufficient space industry that is free of U.S. influence. It certainly takes time to realize this aspiration. However, with its focus still on comprehensive national power and economic development, China's technological successes and innovations are likely to benefit its high-tech industries by

spinning-off their results. If that is the case, the U.S. will gradually lose its dominance in the space technology and innovation.

As proven by its space undertakings and its attitude in space development, China is not likely to run an outright space race (not even space arms race) with the U.S. Therefore, it is possible for the U.S. to work peacefully in space with China. To the minimum extent, both countries can communicate their intentions and reduce the misunderstanding over space militarization issues. Therefore, this study offers several recommendations for future policy consideration.

### Recommendations

Increasing official meetings and academic exchanges could be the first step to improve mutual understanding. Currently, we have found certain level of misunderstanding in China's political and military leadership over alleged U.S. space militarization. For the U.S. and other major powers, China's inconsistent policy and behavior, lack of transparency and secrecy over space programs make them difficult to trust. This fog of distrust could lead to dangerous security consequences. The U.S. has to continue to engage with China in this regard. From past experiences, it took a long time to initiate any solid talks with China due to the mutual distrust and conflicting interests. Thus, academic exchanges and annual talks between the U.S. Pacific Command and Chinese military leaders are possible preliminary steps. Frequent contact will help to clarify certain policy misunderstandings and build personal relationships. The U.S. has to show China that it does not intend to militarize space and hopes to cooperate with China. Most importantly, it has to clearly communicate with Chinese leaders that any sabotage and attacks against U.S. space asset are intolerable.

It is necessary for both parties to discuss possibilities of establishing space demilitarization convention—where China is eager to push—and space security talks so as to increase mutual trust.

It is mutually beneficial to establish space emergency management cooperative channels. With China becoming the third country with manned space flight programs and U.S. concerns over space technology transfer, space emergency management is a possible channel to establish cooperation. The accumulation of a large amount of space debris has become a serious threat to satellites and manned space vehicles. Sharing space monitoring information can help both sides to prevent disasters from happening. Even more importantly, when an accident occurs, China will require U.S. and Russian help to rescue its Taikonauts from peril. This is another less controversial area that China is likely to work with other countries. In working with these areas, the U.S. can initiate space rescue exercises with China and deepen its understanding of Chinese space programs. Again, these activities will help both sides to build mutual trust and clarify misunderstanding.

Expanding international space information cooperation projects can contribute to working relationship and mutual understanding. Meteorological and earth survey/observation satellites are China's two main space programs. These are two less controversial areas to explore possible cooperation opportunities. Both the U.S. and China are important members for the World Meteorological Organization and other international organizations, which can provide a channel to explore possible space cooperation. For example, the rising sea water temperature in the West Pacific region has significant impact to the regional climate pattern. Chinese satellite data and



research results could help international organizations to understand its long term impact. By promoting this relationship, China can improve its disaster forecasting ability, especially in forecasting droughts and floods that devastate large Chinese lands in recent years; the U.S. and international community can demonstrate this constructive effort to Chinese leadership and encourage China to engage other less sensitive cooperation projects. Thus, this seemingly non-strategic cooperation could possibly have strategic influences over the long run.

The U.S. has to assure regional allies and partners with strong security commitments. Besides seeking cooperative opportunities with China, reassuring regional countries is even a more important policy for the U.S. to pursue. The sense of China's threat is likely to prompt regional powers to engage in costly military build-ups. In turn, it will cause dangerous open-ended arms races. Especially for those powerful countries with long disputing territorial disputes and technological capability of their own, such as India and Japan, they would have every reason to develop countermeasures to off-set China's space superiority. Therefore, reassuring those countries that the U.S. will honor its commitments and provide timely support to them is very important. At the same time, the U.S. should communicate a clear message to China that it will support those regional countries facing aggression and coercion. By doing so, it will make those countries planning to develop weapons to counter Chinese threats have second thoughts, and hopefully reduce the possibility of an arms race in the region.

Preventing possible space technology proliferations should be taken into account. Currently, China's aggressive attitude in seeking space market to help its space industries leads to concerns that its space technologies may end up in certain undesired

parties, especially those outlaw regimes, terrorist organizations and criminal cartels. Due to their dual-purpose characteristics, space technologies like encrypted satellite communication and small satellites are difficult to control. Especially when they are not U.S. patented technologies, it is almost impossible to forcefully demand China not to export them. Therefore, close monitoring the end users of those technologies is critical to prevent them from falling into undesired parties' hands. This will be a very difficult challenge requiring international intelligence, commerce, law-enforcement and diplomatic cooperation. The U.S. even needs to dissuade China from selling those sensitive technologies to certain countries without a robust control and monitor system to space assets. Hopefully this will work. However, if the U.S. and Western powers continue to block China's space business opportunities, it is likely that China will continue to seek work-arounds. Therefore, the U.S. government needs to consider how to revise its 2002 satellite export control to China to reduce its incentive to go extreme.

The U.S. should explore possibilities in outer space cooperation with China. Many security experts are concerned that cooperating with China in space development will help it develop more powerful tools to jeopardize Asia-Pacific regional security. However, China has the capacity to develop those capabilities on its own. It is only a matter of time before China acquires such threatening technologies. A country long suspicious of the Western block, when it finally builds up those abilities, will make it more difficult to negotiate. Therefore, finding cooperative possibilities to create a positive political atmosphere is more constructive to global security than merely technological blocking. China has worked with the European Aerospace Agency in remote robot programs to explore the Moon and Mars. This shows evidence that there

are still possibilities to cooperate with China and lead it to a more constructive way. Deep space exploration is a field that could help China to develop its own space technologies and merge it into international cooperation. In turn, there is hope to change China's zero-sum game mentality toward security issues.

### Conclusion

China's space capability development will improve its comprehensive national power. In particular, the massive new generation of scientists and engineers, motivated by its successes in manned space flight programs, will create a paradigm change in China's innovation and technological development. But judging by its resources and investments in space programs, China is unlikely to engage in an outright space arms race with the U.S. Therefore, China does not pose an immediate threat to U.S. space dominance. Nonetheless, its increasingly capable space programs will change the Asia-Pacific regional security landscape. Without effective precautions and solid reassurance to regional countries, it is possible to cause a strategic arms race in the region. The U.S. cannot exclude this possibility and should take necessary measures to prevent it from happening.

It appears that the Chinese political and military leadership misunderstand U.S. space dominance and space militarization issues. The U.S. has to proactively approach Chinese leadership and clarify this misunderstanding and reduce mistrust. Under the current situation, increasing all possible contacts between both sides' policy-makers, military leaders, security experts and space practitioners, is possible and should be undertaken in order to build mutual understanding and trust. In the long run, this will help the new generation of Chinese leaders work their space programs toward a more

positive path to regional stability and prosperity. Thus, the U.S. and international community should have a more forward looking view in changing deep-rooted Chinese mindset.

In sum, Chinese space capability development has the potential to improve its comprehensive national power, national prestige and international standing; but it could also negatively change the regional security landscape. As China's society, economy and politics are changing, there are opportunities to change its mentality toward the West and create a cooperative rising great power. All depend on how the U.S. and international community work together to promote a positive atmosphere of trust and mutual interests.

## Endnotes

<sup>1</sup> Mao decided to develop satellite during the Chinese Communist Party National Congress on May 17, 1958 and launched so called "project 581" to send satellite to orbit by 1959 to celebrate 10<sup>th</sup> anniversary of PRC's founding.  
<[http://en.wikipedia.org/wiki/Chinese\\_space\\_program](http://en.wikipedia.org/wiki/Chinese_space_program)>

<sup>2</sup> Marcia S. Smith, CRS report to congress, "China's Space Program: An Overview," U.S. Congressional Research Service, October 18, 2005 <[www.crs.gov/RS21641](http://www.crs.gov/RS21641)>

<sup>3</sup> The U.S. Congress, House Report 105-851, "Report of the Selection Committee on U.S. National Security and Military/Commercial Concerns with the People's Republic of China," Washington D.C., June 14, 1999, <<http://www.access.gpo.gov/congress/house/hr105851/index.html>>

<sup>4</sup> An independent Chinese space analyst Chen Lan coined this term. Marcia S. Smith, CRS report to congress, "China's Space Program: An Overview," U.S. Congressional Research Service, October 18, 2005.

<sup>5</sup> The Information Office of China's State Council, "China's Space Activities in 2004," p 4-6, August 6, 2004, Beijing.

<sup>6</sup> Ashley J. Tellis, "China's Space Weapons," The Wall Street Journal, July 23, 2007, <<http://www.carnegieendowment.org/publications/index.cfm?fa=view&id=19452>>.

<sup>7</sup> Right after its ASAT test was revealed, India and several countries protested China's undertaking, though the Chinese government denied any malicious intention and claimed it was a scientific test. Other countries' responses see, Ashley J. Tellis, "China's Military Space

Strategy." *Survival*, Vol. 49, Issue 3, 2007. <http://www.heritage.org/research/lecture/chinas-anti-satellite-weapons-and-american-national-security>  
<<http://www.foxnews.com/story/0,2933,244761,00.html>>  
<[www.wmdinsights.com/l13/l13\\_EA1\\_SP\\_PRC\\_ASAT.htm](http://www.wmdinsights.com/l13/l13_EA1_SP_PRC_ASAT.htm)>

<sup>8</sup> Shirley A. Kan, "China and proliferation of weapons of mass destruction and missiles," August 16, 2010, [www.crs.gov/RL31555.pdf](http://www.crs.gov/RL31555.pdf)

<sup>9</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p22-23, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>10</sup> Michael P. Pillsbury, "An Assessment of China's Anti-satellite and Space Warfare Programs, Policies and Doctrines" July 19, 2007, < [www.uscc.gov/.../FINAL\\_REPORT\\_1-19-2007\\_REVISED\\_BY\\_MPP.pdf](http://www.uscc.gov/.../FINAL_REPORT_1-19-2007_REVISED_BY_MPP.pdf)>

<sup>11</sup> Ibid.

<sup>12</sup> Rosita Dellios, "China's Space Program: A Strategic and Political Analysis," December 2005, < [www.international-relations.com/.../ChinasSpaceWB.htm](http://www.international-relations.com/.../ChinasSpaceWB.htm)>

<sup>13</sup> The Shanghai Cooperation Organization was established in 2001 to promote security cooperation between China and other Central Asian countries to fight terrorism, separatism and extremism. It is also a platform for China to extend its influence into Central Asia.

<sup>14</sup> The Information Office of China's State Council, "China's Space Activities in 2004," p 8, August 6, 2004, Beijing.

<sup>15</sup> Ibid, p3

<sup>16</sup> Theresa Hitchens, "Russian and Chinese Space-Weapons-Ban Proposal: A Critique," March 31-April 1 2008, UN Institute of Disarmament Research, < [www.unidir.org/pdf/articles/pdf-art2823.pdf](http://www.unidir.org/pdf/articles/pdf-art2823.pdf)>, There are many issues with weapon in outer space. The United States does not agree that there are outer space weapons, hence there is no need for the Russo-Chinese proposed ban. Another problem is that most of the space objects have dual-use capabilities. During war times, most of the "peaceful," "commercial," or "civil" space facilities can be used in aiding military operations. The exception, though, is the ASAT capabilities. They are space-related weapons. What to do with them is a big problem

<sup>17</sup> Shirley Kan, "China's Anti-Satellite Weapon Test," April 23, 2007, [www.crs.gov/RS22652](http://www.crs.gov/RS22652)

<sup>18</sup> Bruce W. MacDonald, "China, Space Weapons, and U.S. Security," Council on Foreign Relations Press, [http://www.cfr.org/publication/16707/china\\_space\\_weapons\\_and\\_us\\_security.htm](http://www.cfr.org/publication/16707/china_space_weapons_and_us_security.htm)

<sup>19</sup> China understood that a head-on conflict with the U.S. is not in its favor. Therefore, certain asymmetrical warfare measures, for example carrier killer, are highly desired. Mark Stoke, "China's Strategic Modernization: Implications for the United States," Strategic Studies Institute, U.S. Army War College, September 1999, Carlisle, PA < <http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=74>>.

<sup>20</sup> The Information Office of China's State Council, "China's Space Activities in 2006," October 2006, <[http://news.xinhuanet.com/english/2006-10/12/content\\_5193446.htm](http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm)>

<sup>21</sup> Ashley J. Tellis, "China's Space Weapons," The Wall Street Journal, July 23, 2007, <<http://www.carnegieendowment.org/publications/index.cfm?fa=view&id=19452>>.

<sup>22</sup> This organization includes Bangladesh, China, Iran, Mongolia, Peru, Thailand, Indonesia and Turkey, headquartered in Beijing. Except China, all other members are almost without any tangible space capability. Its main purpose is to expand China's influence over space issues. <[http://en.wikipedia.org/wiki/Asia-Pacific\\_Space\\_Cooperation\\_Organization](http://en.wikipedia.org/wiki/Asia-Pacific_Space_Cooperation_Organization)>

<sup>23</sup> Ashley J. Tellis, "China's Space Weapons," The Wall Street Journal, July 23, 2007.

<sup>24</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p 17, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>25</sup> Ibid. p 34

<sup>26</sup> With export control by the U.S. and other Western countries, China has adopted a cautious "trial and error" approach in its space development to avoid setbacks. This could reflect in *Shenzhou-IV* spacecraft case, which China did not make public of exact information until it successfully returned to the Earth.

<sup>27</sup> China's active participation in European Galileo program and its heavy investment in *Beidou* satellite program, as well as proactive efforts in ISR related space programs, all show that China understood the significance of military space application in modernizing the PLA.

<sup>28</sup> The solid rocket launching capability can complement and replenish its low-orbit ISR satellite surge, which has had very limited life-span and made no commercial sense. However, it is very useful during a wartime case when its satellite are either jammed or destroyed by the enemy. See Andrew S. Erickson, "Eyes in the Sky," p 38-39, Proceeding, April 2010.

<sup>29</sup> Richard D. Fisher, "China's military modernization: building for regional and global reach," p 17-21, Greenwood Publishing Group, Westport, CT, 2008.

<sup>30</sup> Chinese official and its space white papers both mention its effective satellite communication support for a global port call fleet in 2006 and Somalia anti-piracy task force. The Information Office of China's State Council, "China's Space Activities in 2006," October 2006, <[http://news.xinhuanet.com/english/2006-10/12/content\\_5193446.htm](http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm)>

<sup>31</sup> James A. Lewis, "Surmounting the Peak: China's Space Program," November 16, 2005, Center for Strategic and International Studies. <[csis.org/files/media/csis/pubs/051116\\_china\\_space\\_program](http://csis.org/files/media/csis/pubs/051116_china_space_program)>

<sup>32</sup> Chinese leadership scheduled the *Shenzhou IV* and later events consistent with its Communist Party National Congress, which clearly showed their intention to deliver a strong strategic communication to Chinese people. Wu Chunsi, "Development Goals of China's Space Program," <[www.wsichina.org/attach/cs2\\_9.pdf](http://www.wsichina.org/attach/cs2_9.pdf)>

<sup>33</sup> President Hu Jintao praised the launch as reflecting gloriously on the motherland and showcasing China's technological advances. Rosita Dellios, "China's Space Program: A Strategic and Political Analysis," December 2005, < <http://www.international-relations.com/CM7-1WB/ChinasSpaceWB.htm>>

<sup>34</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p 34, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>35</sup> Congressional Hearing Record, "China's Proliferation Practices, and the Development of Its Cyber and Space Warfare Capabilities," May 20, 2008, < [www.uscc.gov/hearings/2008hearings/transcripts/08\\_05\\_20\\_trans/08\\_05\\_20\\_trans.pdf](http://www.uscc.gov/hearings/2008hearings/transcripts/08_05_20_trans/08_05_20_trans.pdf) "China's Proliferation Practices, and the Development of Its Cyber and Space Warfare Capabilities" >

<sup>36</sup> Mark Stoke, "China's Strategic Modernization: Implications for the United States," Strategic Studies Institute, U.S. Army War College, September 1999, Carlisle, PA < <http://www.strategicstudiesinstitute.army.mil/pubs/display.cfm?pubID=74>>.

<sup>37</sup> Carlo Kopp, "Advances in PLA's C4ISR Capabilities," Jamestown Foundation, February 18, 2010, < [http://www.jamestown.org/programs/chinabrief/single/?tx\\_ttnews%5Btt\\_news%5D=36052&tx\\_ttnews%5BbackPid%5D=25&cHash=44f7c29ff2](http://www.jamestown.org/programs/chinabrief/single/?tx_ttnews%5Btt_news%5D=36052&tx_ttnews%5BbackPid%5D=25&cHash=44f7c29ff2)>

<sup>38</sup> The most notable cases include 1980 Israeli-Syria War, 1990-1991 First Gulf War, and 1999 Kosovo War, attackers utilized soft and hard kill measures to paralyze defenders' integrated air defense system, C2 system, communication nodes and even power grid as prelude of major operations.

<sup>39</sup> U.S. Joint Chiefs of Staff, Joint Pub, 3-14, "Space Operations," p 4-29, January 6, 2009.

<sup>40</sup> Ed Glenda Armstrong, "Operation Iraqi Freedom-Lessons Learned," U.S. Air Force Air University, Maxwell AFB, AL, December 2004, < <http://www.au.af.mil/au/aul/bibs/oifll.htm>>

<sup>41</sup> In last decade, China has launched Beidou (navigation/timing), Yaogan/Jianbing (synthetic aperture radar), Shiyan, Beijing, Chuangxin (SIGINT, ELINT and Imagery), Haiyang (oceanographic survey), Tianlian (C3), Dongfanghong (communication) series satellites and Qu Dian integrated C4I system, all serve large part for its military applications. See Andrew S. Ericson, "Eyes in the Sky" p 37-40, Proceedings, April 2010, U.S. Naval War College,

<sup>42</sup> CBSNEWS, "China Aircraft Carrier Worries Neighbors," April 22, 2009, < <http://www.cbsnews.com/stories/2009/04/22/world/main4960774.shtml>>

<sup>43</sup> The International Institute of Security Studies, "Strategic Comments: China's Three-point Naval Strategy," October 2010, < <http://www.iiss.org/publications/strategic-comments/past-issues/volume-16-2010/october/chinas-three-point-naval-strategy/>>; Andrew Ericson, "China's Evolving Anti-access Strategy: Where's the Nearest (U.S.) Carriers?" September 10, 2010, < [http://www.jamestown.org/single/?no\\_cache=1&tx\\_ttnews%5Btt\\_news%5D=36810](http://www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=36810)>

<sup>44</sup> "Piracy in Somalia," < [http://en.wikipedia.org/wiki/Piracy\\_in\\_Somalia](http://en.wikipedia.org/wiki/Piracy_in_Somalia)>

<sup>45</sup> Andrew Ericson and Andrew Wilson, "China's Aircraft Carrier Dilemma," Naval War College Review, Autumn 2006, U.S. Naval War College, Newport, RI.

<sup>46</sup> Benjamin S. Lambeth, "Air Power against Terror: America's Conduct of Operation Enduring Freedom," RAND Corporation, 2005, < [www.rand.org/pubs/monographs/2006/RAND\\_MG166-1.sum.pdf](http://www.rand.org/pubs/monographs/2006/RAND_MG166-1.sum.pdf)>

<sup>47</sup> The Office of Secretary of Defense, "Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2010," p29-30, the U.S. Department of Defense, August 16, 2010, Washington D.C.

<sup>48</sup> Ibid, p-30

<sup>49</sup> Hitting a moving vessel at sea involves many complicated tasks. First, the attacker has to verify the target and gain correct situational awareness. Second, it has to cue-in the missile to the target. The targeting activities, including active radar screening, could warn the targeted vessel. Finally, the missile has to overcome countermeasures onboard the targeted vessels. For using ballistic missile against aircraft carrier among a cluster of vessel group, it poses even greater challenge.

<sup>50</sup> Current *Beidou* positioning satellite is accurate in 20 meter deviation, which is far from supportive to precision weapon. Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p 27, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>51</sup> General Headquarters of the R.O.C Army, Field Manuel 02 "Operations", p 4, December 2000, Taoyuan, Taiwan.

<sup>52</sup> The Information Office of China's State Council, "China's Space Activities in 2006," October 2006, <[http://news.xinhuanet.com/english/2006-10/12/content\\_5193446.htm](http://news.xinhuanet.com/english/2006-10/12/content_5193446.htm)>

<sup>53</sup> Andrew Erickson, "Seizing the Highest High Ground: China's Aerospace Development and Its Larger Implications." Easter-West Center, November 3, 2004, < [www.eastwestcenter.org/fileadmin/stored/pdfs/IGSCwp003.pdf](http://www.eastwestcenter.org/fileadmin/stored/pdfs/IGSCwp003.pdf)>; Ed. Richard Allan Bitzinger, "People's Liberation Army in the New Century," November 2008, Nanyang Technological University, Singapore, < [www.rsis.edu.sg/publications/conference\\_reports/RSIS\\_ConferenceReport\\_PLA\\_120109.pdf](http://www.rsis.edu.sg/publications/conference_reports/RSIS_ConferenceReport_PLA_120109.pdf)>.

<sup>54</sup> Jon Kyl, speech transcript at the Heritage Foundation, "China's Anti-satellite Weapons and American National Security," February 1, 2007.

<sup>55</sup> Michael P. Pillsbury, "An Assessment of China's Anti-satellite and Space Warfare Programs, Policies and Doctrines" July 19, 2007, < [www.uscc.gov/.../FINAL\\_REPORT\\_1-19-2007\\_REVISIED\\_BY\\_MPP.pdf](http://www.uscc.gov/.../FINAL_REPORT_1-19-2007_REVISIED_BY_MPP.pdf)>

<sup>56</sup> Stephanie Lieggi and Leigh Aldrich, "China's Manned Space Program: Trajectory and Motivations," < [cns.miis.edu](http://cns.miis.edu) > Publications > Story Archives



<sup>57</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p 29, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>58</sup> Ibid, p38

<sup>59</sup> Office of Secretary of Defense, "Annual Report to Congress: Military Power of the People's Republic of China 2007," Department of Defense, Washington D.C.

<sup>60</sup> Brian Harvey, Henk H. F. Smid, Theo Pirard, "Emerging Space Powers: The New Space Programs of Asia, the Middle East and South-America," p17-21, Springer, March 2010, New York.

<sup>61</sup> Shirley A. Kan, "China and proliferation of weapons of mass destruction and missiles," August 16, 2010, [www.crs.gov/RL31555.pdf](http://www.crs.gov/RL31555.pdf)

<sup>62</sup> Congressional Hearing Record, "China's Proliferation Practices, and the Development of Its Cyber and Space Warfare Capabilities," May 20, 2008, < [www.uscc.gov/hearings/2008hearings/transcripts/08\\_05\\_20\\_trans/08\\_05\\_20\\_trans.pdf](http://www.uscc.gov/hearings/2008hearings/transcripts/08_05_20_trans/08_05_20_trans.pdf)>

<sup>63</sup> The Office of Secretary of Defense, "Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2010," p26-28, the U.S. Department of Defense, August 16, 2010, Washington D.C.

<sup>64</sup> Ibid, p 29-37

<sup>65</sup> SINA NEWS 11 January 2010, "China Tested Land-based Anti-ballistic Missile Technology," < <http://news.sina.com.cn/z/wgljfdsy/index.shtml>>

<sup>66</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p22-23, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

<sup>67</sup> Brian Harvey, "China's Space Program - From Conception to Manned Spaceflight," p172-176, Springer, July 2004, New York; Ashley J. Tellis, "China's Space Weapons," The Wall Street Journal, July 23, 2007.

<sup>68</sup> Kevin Pollpeter, "Building for the Future: China's Progress in Space Technology during the 10th Five-Year Plan and the U.S. Response", p39, March 2008, Strategic Studies Institute, U.S. Army War College, Carlisle, PA.

